#24 will be assigned

$$\int_a^b f = \int_a^c f + \int_c^b f = \int_c^b f + \int_a^c f$$

Use $c=0$, for instance $= \int_c^b f - \int_c^a f$

#25 $\ln y = e^y \sin x$

$$\frac{y'}{y} = e^y y' \sin x + e^y \cos x$$

$$\frac{y'}{y} - e^y y' \sin x = e^y \cos x$$

$$y'\left(\frac{1}{y} - e^y \sin x\right) = e^y \cos x$$

$$y' = \frac{e^y \cos x}{\frac{1}{y} - e^y \sin x \cdot \frac{y}{y}}$$

y is implicitly a function of x

$$= \frac{y e^y \cos x}{1 - e^y \sin x}.$$

$\ln(x^3)$ $\quad (\ln x)^3$

$\frac{d}{dx}(x^3) = 3x^2$

$\frac{d}{dx}(3^x) = (\ln 3)\, 3^x$

$\int 3^x dx = \frac{1}{\ln 3} 3^{x} + C$

$\frac{d}{dx} e^x = e^x \quad \frac{d}{dx} e^{u(x)} = e^{u(x)} u'(x)$

$\frac{d}{dx} \ln x = \frac{1}{x}$

$3^x = e^{\ln(3^x)} = e^{x \ln 3}$

$= e^{(\ln 3) x}$

$= e^{(\ln 3)x} \cdot \frac{d}{dx}[(\ln 3)x]$

$= e^{x \ln 3} \cdot \ln 3$

$= e^{\ln(3^x)} \cdot \ln 3$

$= (\ln 3) e^{\ln(3^x)}$

$= (\ln 3)\, 3^x$

$\frac{d}{dx} \ln u(x) = \frac{1}{u(x)} u'(x)$

$= \frac{u'(x)}{u(x)}$

$\int \ln x \, dx$ still dunno.

$= x \ln x - x + C$

Integration by parts.

$\int u\, dv = uv - \int v\, du$

$u = \ln x$

$dv = dx$

Differentiate (Homework)

7.3

like #14 $y = \ln(5\theta e^{2\theta})$

$$y = \int_{e^{4\sqrt{x}}}^{e^{2x}} \ln \xi \, d\xi$$

$y = x^{\pi}$, $y = \pi^{x}$

$$\boxed{\int e^u du = e^u + C}$$

Integrate

7.3 $\displaystyle\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \left(e^{\cot\theta} + 1\right) \csc^2\theta \, d\theta$

$$\int_0^{\sqrt{\ln \pi}} 2x e^{x^2} \cos\left(e^{x^2}\right) dx$$

7.4 $\displaystyle\int 7^x dx$

$$\int_1^4 \frac{3^{\sqrt{x}}}{\sqrt{x}} dx$$

$$\int_{\frac{1}{10}}^{10} \frac{\log_{10}(10x)}{x} dx$$

* $\displaystyle\int u \, du = \frac{u^2}{2} + C$

A couple more (differential equations.)
7.3, 7.4

§7.5 Indeterminate forms & L'Hôpital's Rule.

When we encounter

$$\lim_{x\to a} \frac{f(x)}{g(x)} = \frac{0}{0} \;!?, \text{ and } g'(x) \neq 0$$

when $x \neq a$, then

$$\lim_{x\to a} \frac{f(x)}{g(x)} = \lim_{x\to a} \frac{f'(x)}{g'(x)}$$

$$\lim_{x\to 0} \frac{\sin x}{x} = \lim_{x\to 0} \frac{\cos x}{1} = 1$$

Comes up all the time.

#51' $\displaystyle\lim_{x\to 1^+} x^{\frac{1}{1-x}} = \frac{1}{e} \;!$ 1^{∞} → ln y sitch.

$$y = x^{\frac{1}{1-x}}$$

$$\ln y = \ln\left(x^{\frac{1}{1-x}}\right) = \frac{1}{1-x} \ln x \qquad \infty \cdot 0$$

$$= \frac{\ln x}{1-x} \qquad \frac{0}{0}$$

L'Hopital sez: $\displaystyle\lim_{x\to 1^+} \frac{\frac{1}{x}}{-1} = \lim_{x\to 1^+} -\frac{1}{x} = -1$

$$= \lim_{x\to 1^+} (\ln y) = -1 \implies$$

$$\lim_{x\to 1^+} e^{\ln y} = \lim_{x\to 1^+} y = e^{-1}$$